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IS 15651 (2006): Textiles - Requirements for environmental labelling [TXD 5: Chemical Methods of Test]

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वस्त्रादि — पर्यावरणीय लेबलिंग की अपेक्षाएँ — विशिष्टि

Indian Standard

TEXTILES — REQUIREMENTS FOR ENVIRONMENTAL LABELLING — SPECIFICATION

ICS 13.020.50; 59.080.01

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

November 2006

Price Group 5

Chemical Methods of Test Sectional Committee, TX 05

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

The Ministry of Environment and Forests, Government of India has instituted a scheme for labelling environment friendly products known as 'ECO-Mark scheme'. This standard is based on the criteria as notified by the Government of India *vide* Gazette Notification No. 322, dated 8 October 1996 for labelling textile products as environment friendly.

The ECO-Mark scheme is being operated by the Bureau of Indian Standards. However, to obtain the licence to use the ECO-Mark on a product, it is also essential to obtain BIS licence to use the Standard Mark as per the relevant Indian Standard for that product.

The composition of the Committee responsible for the formulation of this standard is given in Annex F.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

TEXTILES — REQUIREMENTS FOR ENVIRONMENTAL LABELLING — SPECIFICATION

1 SCOPE

This standard prescribes requirements for environmental labelling of textile products made from cotton, wool, silk or man-made fibres or their blends.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1390 : 1983	Methods for determination of *p*H value of aqueous extracts of textile materials (*first revision*)
14563	Textiles — Determination of formaldehyde:
(Part 1) : 1998	Free formaldehyde
(Part 2) : 1998	Released formaldehyde
15570 : 2005	Textile — Methods of test — Detection of banned azo colourants in coloured textiles.

3 REQUIREMENTS

3.1 General Requirements

The product manufacturers must produce the consent clearance as per the provisions of *Water (Prevention and Control of Pollution) Act,* 1974 *and Air (Prevention & Control of Pollution) Act,* 1981, *Water (Prevention and Control of Pollution) Cess Act,* 1977, respectively, alongwith the authorization, if required under *Environment (Protection) Act,* 1986 and the rules made thereunder to the Bureau of Indian Standards while applying for ECO-Mark. Additionally, the manufacturer shall produce documentary evidence on compliance of the provisions related to noise level and occupational health under the provisions of *Factories Act,* 1948 and rules made thereunder.

3.2 Quality Requirements

The textile products shall meet the requirements specified in the relevant Indian Standards on these products. In cases where no Indian Standard exists, the textile products shall comply to the requirements as agreed to between the buyer and the seller.

3.3 Environmental Labelling Requirements

The textile products shall meet the environmental labelling requirements as specified in Table 1.

4 SAMPLING

4.1 Lot

All pieces of the textile product of the same type and quality delivered to a buyer against one dispatch note shall constitute a lot.

4.2 Random sample from the lot shall be drawn as per the procedure specified in the relevant Indian Standard or as agreed to between the buyer and the seller.

5 CRITERIA FOR CONFORMITY

5.1 The textile material shall conform to all the quality requirements as specified in the relevant Indian Standard or as per the contract specification or agreement between the buyer and the seller.

5.2 All the samples of the textile material shall also meet the environmental labelling requirements as specified in this standard.

6 MARKING

6.1 The textile product shall be marked with the following information on a securely stitched cloth label at an appropriate place such as top or bottom corner, collar, etc:

a) Name of the textile material;
b) Nature and composition of the textile material;
c) Batch No./Lot No. and date of manufacturing;
d) Manufacturer's name, address and/or trade-mark; and
e) Any other information required by the law in force.

6.2 BIS Certification Marking

The textile product may also be marked with the ECO-Mark along with the Standard Mark in case the textile

Table 1 Environmental Labelling Requirements

(*Clause* 3.3)

Sl No.	Parameter	Requirement mg/kg (ppm), *Max*			Method of Test, Ref to
		Baby Clothing	Close to Skin	Outerwear	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Free and releasable formaldehyde	20	75	300	IS 14563 (Part 1)
ii)	Extractable heavy metals by artificial acidic sweat:				Annex A
	a) Antimony (Sb)	5	10	10	
	b) Arsenic (As)	0.2	1.0	1.0	
	c) Lead (Pb)	0.2	1.0	1.0	
	d) Cadmium (Cd)	0.1	0.1	0.1	
	e) Mercury (Hg)	0.02	0.02	0.02	
	f) Chromium Total	0.1	2.0	2.0	
	g) Cobalt (Co)	1.0	4.0	4.0	
	h) Copper (Cu)	25.0	50.0	50.0	
	j) Nickel (Ni)	1.0	4.0	4.0	
iii)	Pentachlorophenol (PCP)	0.05	0.5	0.5	Annex B
iv)	2, 3, 5, 6 Tetra-cholorophenol (TeCP)	0.05	0.5	0.5	Annex B
v)	Orthophenyl phenol (OPP)	0.5	1.0	1.0	Annex B
vi)	Organo-tin compounds				Annex C
	a) Tributyltin (TBT)	0.5	1.0	1.0	
	b) Dibutyltin (DBT)	1.0	1.0	1.0	
vii)	Pesticides (sum parameter)	0.5	1.0	1.0	Annex D
viii)	Banned pesticides	Nil[1]	Nil[1]	Nil[1]	Annex D
ix)	*p*H of aqueous extract	4.0-7.5	4.0-7.5	4.0-7.5	IS 1390 (cold method)
x)	Banned aryl amines from azo dyes	30.0	30.0	30.0	IS 15570

NOTE — The list of pesticides registered for use in India is given at Annex E for information.

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[1] Below detectable limits.

product meets the quality requirements specified in the relevant Indian Standard in addition to the environmental labelling requirements specified in this standard. If no Indian Standard exists on the textile product and the product meets the quality requirements agreed to between the buyer and the seller in addition to the environmental labelling requirements specified in this standard, the product may be marked with the ECO-Mark.

6.2.1 The use of the Standard Mark and the ECO-Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the ECO-Mark and the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

7 PACKING

7.1 The textile product shall be packed in appropriate recyclable or bio-degradable packaging material as agreed to between the buyer and the seller.

ANNEX A

[*Table* 1, *Sl No.* (ii)]

DETERMINATION OF EXTRACTABLE HEAVY METALS

A-1 SCOPE

A-1.1 This method is used for the detection and estimation of leachable heavy metals from textile materials.

A-2 PROCEDURE

A-2.1 Take about 5.0 g of the sample in duplicate and weigh accurately. Transfer the sample to a 250 ml stoppered conical flask containing 100 ml of acid perspiration solution pre-heated to 50°C, composition of which is described in **A-2.2**.

A-2.2 Prepare the acid perspiration solution by adding the following:

a) L-Histidine monohydrochloride: 0.5 g/l
b) Sodium chloride: 5.0 g/l
c) Sodium dihydrogen orthophospate: 2.2 g/l
d) Water — Metal free (Ultra pure water)
e) Acetic acid to adjust the *p*H of the solution to 5.5

A-2.3 Keep the flask containing the sample and the acid perspiration solution in a water bath at a material to liquor ratio of 1:20 for a period of 30 min at 50°C ± 2°C. Filter the extract through filter paper and cool it to room temperature. Acidify the solution by adding around 1.0 ml concentrated nitric acid. Concentrate to 70 to 80 ml by heating on a hot plate. Make the final volume up to 100 ml after cooling. Process one blank as per above method without any specimen.

A-2.4 Aspirate the above specimen extract into AAS-flame application for respective metals and obtain their absorbance and concentration against calibration curve (three point level) of standard solution of respective metal by using atomic absorption spectrometer.

A-2.4.1 *Calibration Curve*

Prepare the standard metal solution for three different concentrations from the stock solution of 1 000 ppm for each metal and make a calibration graph using the instrument.

NOTES

1 The concentration of the standard solution is given below for guidance which may vary from instrument to instrument depending upon the sensitivity of the instrument:

Sl No.	*Name of the Metal*	*Concentration (ppm)*
i)	Copper (Cu)	1, 2 and 4
ii)	Chromium (Cr)	2, 4 and 8
iii)	Cobalt (Co)	2, 4 and 8
iv)	Cadmium (Cd)	0.5, 1.0 and 2.0
v)	Nickel (Ni)	2, 4 and 8
vi)	Lead (Pb)	2, 4 and 8
vii)	Arsenic (As)	10, 20, 40, ppb
viii)	Mercury (Hg)	20, 40, 80, ppb

2 Mercury and Arsenic are analysed by hydride generation technique in flameless condition (cold vapour technique) by using:

a) Sodium borohydride, AR grade (Na BH4) solution prepared by dissolving 3.0 g of powdered NaBH4 and 3.0 g of NaOH in de-ionized water, making up to 500 ml and filtering the solution into borohydride reagent bottle; and
b) 500 ml of concentrated hydrochloric acid (approximately 3 M).

The analysis is done using AAS as per the operational procedures of the equipment given by the supplier.

ANNEX B

[*Table* 1, *Sl No.* (iii), (iv) *and* (v)]

METHODS FOR EXTRACTION AND DETERMINATION OF PENTACHLOROPHENOL (PCP) AND TETRACHLOROPHENOL (TeCP)

B-1 GC-ECD METHOD

B-1.1 Scope

This method is used to extract and determine pentachlorophenol (PCP), tetrachlorophenol (TeCP) or ortho phenyl phenol (OPP) present in textiles.

B-1.2 Reagents and Chemicals

a) Acetone (AR Grade)
b) *n*-Hexane (AR Grade)
c) *n*-Hexane (HPLC Grade)
d) Con. Sulphuric Acid (AR Grade)

e) Celite 545

f) Anhydrous Sodium Sulphate (AR Grade)

g) Whatman Filter Paper & Thimble

h) Glass Wool

j) Pentachlorophenol (PCP), High purity >99%

k) Tetrachorophenol (TeCP), High purity >99%

m) Hexachlorobenzene (HCB), High purity >99%

n) Aceticanhydride Solution (AR Grade)

p) Trimethylamine solution (AR Grade)

B-1.3 Preparation of Standard Solutions

a) PCP (1 000 ppm) Solution in *n*-Hexane (Stock Solution A):

Weigh 100 mg of PCP and dissolve in *n*-Hexane (AR Grade) and make the volume up to 100 ml with *n*-Hexane.

b) PCP (10 ppm) Solution in *n*-Hexane, (Intermediate Stock Solution B):

Pipette out 1.0 ml of "stock solution A" into 100 ml volumetric flask and make the volume up to the mark with *n*-Hexane.

Prepare the Stock Solution and Intermediate Stock Solutions for TeCP and HCB as per the procedure mentioned above for PCP.

B-1.4 Sample Preparation

B-1.4.1 *Extraction of PCP, TeCP and OPP from Textiles*

Weigh accurately about 20 to 30 g of fabric sample and cut it into small pieces of about 1 cm^2. Transfer the sample cuttings to the soxhlet of the soxhlet extractor assembly. Add about 200 ml of acetone (AR Grade) to the extraction flask (that is sufficient quantity required for one and half cycles). Carry out the extraction for about 40 cycles (that is for 8 to 10 h). Concentrate the extract and evaporate to dryness by distillation in the soxhlet itself. Remove the flask and cool to room temperature. Dissolve the residue in 5-10 ml of *n*-Hexane (AR Grade).

B-1.4.2 *Sample Extract Clean-up*

Pass the sample extract in *n*-Hexane through cellite-sulphuric acid column (*see* Note) and elute it with about 50-60 ml *n*-Hexane. Concentrate the eluted *n*-Hexane to 10 ml in vacuum evaporation unit at 40-45°C.

NOTE — Oven dry Celite 545 powder at 110°C for 2 h. Cool it to room temperature. Weigh 4.0 g of celite and add 2.0 ml of Con. Sulphuric Acid. Mix it thouroughly and add *n*-Hexane (AR Grade) 30-40 ml. Take a glass column (1.5 cm diameter, 30 cm in length). Put small amount of glass wool at the bottom of column. Add 2.0 g of anhydrous Sodium Sulphate over glass wool. Rinse the column with *n*-Hexane. Transfer the Celite mixture into the column. Again put 2.0 g of anhydrous Sodium Sulphate. Wash this column with *n*-Hexane (30 ml).

B-1.4.3 *Acetylation of PCP and TeCP*

Transfer the concentrated solution in *n*-Hexane into 60 ml separating funnel containing 30 ml of 18.82 g/l solution of potassium carbonate. Add 2.0 ml of acetic anhydride and 1.0 ml of triethylamine solution. Shake the mixture for 30 min. Collect the *n*-Hexane layer into vacuum evaporation flask (100 ml) through anhydrous sodium sulphate bed. Repeat extraction twice with 15-20 ml *n*-Hexane at a time for 5 min interval and collect all the extracts. Evaporate the extract to 1.0 ml in vacuum evaporator at 40-45°C. Transfer the concentrated extract (1.0 ml) into 10.0 ml volume flask, thoroughly with *n*-Hexane (HPLC grade). Add 1.0 ml solution of hexachlorobenzene (10.0 µg/ml in *n*-Hexane) as internal standard and make up the volume up to 10.0 ml with *n*-Hexane (HPLC grade). Acetylate the standard solution of PCP or TeCP (10 µg) also as specified above.

B-1.5 GC-ECD Analysis

Analyze the acetylated extract (10.0 ml) by gas chromatograph with electron capture detector for following GC-conditions:

a) Column — HP-1/DB-1, 30 m length, 0.2 mm column I-D, 0.25 µ film thickness or using DB-5 or equivalent column, 0.32 mm I-D, 0.25 µ film thickness

b) Carrier gas — Hydrogen

c) Column flow — 1.0 ml/min column head pressure (7-8 psi)

d) Split ratio — 1:50

e) Auxiliary gas — Nitrogen (30 ml/min)

f) Injection temperature — 260°C

g) Detection temperature — 280°C

h) Oven temperature — Initial 80°C for 1 min and raised to 190°C at the rate of 20°C/min and further to 280°C at the rate of 10°C/min with a total run time of 15.5 min

j) Volume to be injected — 1.0 µl

B-1.6 Calibration and Determination

Inject 1.0 ml of standard mixture of PCP or TeCP and HCB (1.0 ppm each) in GC-ECD. Conduct single level calibration on area basis. Then inject sample solution of 1.0 µl and determine PCP or TeCP against the calibration curve obtained.

B-2 GC-MS METHOD

B-2.1 Scope

This method is used to extract pentachlorophenol (PCP) or tetrachlorophenol (TeCP) present in textiles, dyes, starches, gums, etc.

B-2.2 Sample Preparation

Weigh accurately about 1 g of sample after proper sampling and transfer it to a reaction vessel and sonicate in a ultrasonic bath for 30 min at 40°C. Cool to room temperature and filter the sample with 0.45 µm Whatman filter paper. Concentrate the solution by heating in a water bath kept at 45°C to 50°C and make the volume up to 5 ml by adding acetone. Transfer 1 ml of sample solution, 10 µl of PCP or TeCP internal standard solution and 10 µl acetic anhydride to CD-vial, seal it and hand and shake several times. Acetylate the standard solution of PCP or TeCP (10 µg) also as specified above.

B-2.3 GC-ECD Analysis

Analyse the acetylated extract (10.0 ml) by Gas chromatograph with Electron Capture Detector (ECD) for the flowing GC-conditions.

a) *Column* — HP-1/DB-1, 30 m length, 0.2 mm column I-D, 0.25 µ film thickness (any other equivalent column may also be used)
b) *Carrier gas* — Hydrogen/Nitrogen
c) *Column flow* — 1.0 ml/min column head pressure (7-8 psi)
d) *Split ratio* — 1:50
e) *Auxiliary gas* — Nitrogen (30 ml/min)
f) *Injection Temperature* — 260°C
g) *Detector (ECD) Temperature* — 280°C
h) *Oven Temperature* — Initial 80°C for 1 min raised to 190°C at the rate of 20°C/min
   Then raised to 280°C at the rate of 10°C/min
   Total Run time: 15.5 min
j) *Volume injected* — 1.0 µl

B-2.4 Calibration and Determination

Inject 1.0 ml of standard mixture containing internal standard in GC-ECD. Single level calibration curve on area basis is conducted. Then inject 1.0 µl acetylated sample extract and quantify against calibration curve obtained using inbuilt software.

ANNEX C

[*Table* 1, *Sl No.* (vi)]

METHOD FOR DETERMINATION OF TRIBUTYLTIN (TBT) AND DIBUTYLTIN (DBT) FROM TEXTILE MATERIALS

C-1 PRINCIPLE

C-1.1 The organotin compounds (TBT & DBT) are extracted in a solvent and derivatized to the tetra-alkyl compounds with Griguard regent and are analysed by GC/MS operated in the ion monitoring mode.

C-2 REAGENTS AND CHEMICALS

C-2.1 *Organotin Standards* — Dibutyl dichloride (DBT) and Tributyltin chloride (TBT)

C-2.2 *Griguard Reagent* — Methylamagnesium bromide (3.0 Molar solution in diethyl ether.)

C-2.3 Methanol AR

C-2.4 *n*-hexane AR

C-2.5 Ammonium chloride AR

C-3 WORKING STANDARDS

C-3.1 Prepare standard solutions of 0.2 ppm, 0.5 ppm, 1 ppm and 2 ppm for TBT and DBT.

C-4 CALIBRATION

C-4.1 Take 1 or 2 ml of organotin compound in a Borosil vial (50 ml). Add 1 ml of *n*-Hexane and 0.5 ml of Griguard reagent and cap the vial shake and keep for 20 min with intermediate shake-up. Add 2 ml of 20 percent ammonium chloride. Allow layers to separate. Remove hexane layer to another 10 ml vial and make up the volume to 2 ml and inject on GC/MS.

First derivatise and inject 50 ppm in Scan mode and find out Retention Time (RT) with library search.

TBT — MW 305 (check for ions 247/249/191[93])

DBT — MW 263 (check for ions 207/205/182)

NOTE — Approximate only but check from library spectra, extract ions and choose any three of them in decreasing order of abundance for SIM mode operation.

C-4.2 Inject 2, 1, 0.5 and 0.2 ppm standards in SIM mode and generate calibration curve.

C-5 SAMPLE PREPARATION

C-5.1 Take 3 to 5 g of samples in a conical flask. Add 50 ml of methanol. Keep the flask in ultrasonic bath maintained at 60°C, for 20 min.

C-5.2 Filter and collect the extract in a 250 ml round bottom flask. Again add 50 ml of methanol in the flask and treat it for 10 min at 60°C.

C-5.3 Decant by filteration and collect the extract in a 250 my round bottom flask. Evaporate the extract to dryness on rotavapour/centrifugal evaporator and transfer the residue to reaction vial with 2ml of *n*-Hexane.

C-5.4 Add 0.5 ml Grignard reagent. Keep it for 20 min with intermittent shaking. Add 2 ml of 20 percent NH_4Cl. Remove *n*-Hexane layer to another 10 ml vial and make it up to 2 ml and crimp and inject.

C-5.5 Conduct the analysis using GC-MS under the following conditions:

GC Parameters

Injection : Splitless
Inj. Temp. : 260°C
Column : 30 m × 0.25 mm × 0.25 μm DB-5 or equivalent
Oven programme : 50°C to 300°C at 10°C/min
Column flow rate : 1ml/min
Inj. Volume : 1 or 2 μl

MS Parameters

Mode : SIM
Ions monitored : 191/247/249 (for TBT)
207/205/182 (for DBT)

ANNEX D

[*Table* 1, *Sl No*. (vii) *and* (viii)]

METHOD FOR THE DETERMINATION OF PESTICIDE RESIDUE

D-1 SCOPE

This method is applicable for the extraction of pesticides (excluding 2, 4, 5-T and 2, 4-D) present is textile items including fibres.

D-2 EXTRACTION

Take about 20 to 30 g of sample from different portions and cut it into small pieces of size 5 cm × 5 cm. Weigh the sample accurately and transfer it to the Soxhlet. Take about 250 ml of mixture of *n*-Hexane and dichloromethane (1:1) or petroleum ether and diethyl ether mixture (3:1), AR grade in the flat bottomed flask of the Soxhlet assembly. Carry out the extraction for 8 to 10 h at the rate of 4 to 5 cycles/h. Remove the sample from the Soxhlet and concentrate the solution in the Soxhlet itself up to 5 ml volume using evaporators.

D-3 PREPARATION OF CLEAN UP COLUMN

Take a glass column of 30 cm height, 1.5 cm diameter with stopcock. Prepare a bed of glass wool about 1 cm high at the bottom of the column. Place about 4-5 g of anhydrous sodium sulphite (purified) over the glass wool bed. Pre-dry and pre-wash about 5-8 g of with mixture of *n*-Hexane and dichloromethane or diethyl ether (1:1). Add Celite 545 plus into the column. Add about 2.0 g of anhydrous sodium sulphite again in to the column. Pass about 50 ml of mixture of *n*-Hexane and dichloromethane (1:1) or petroleum ether and diethyl ether mixture (3:1) through the column.

NOTES

1 Alternatively, ready made column High Flow C-18 tubes can be used as clean-up column.

2 Fresh column is to be used for each sample.

D-4 CLEAN-UP OF EXTRACT

Pass the sample extract through the clean up column which is kept vertically. Add about 40-50 ml of *n*-Hexane and dichloromethane (1:1) or petroleum ether and diethyl ether mixture (3:1) to the column in small batches to elute completely. Collect the extract in clean evaporator flask (100 ml) and concentrate/evaporate at 45°C in vacuum evaporator to dryness. Dissolve the pesticide residue in 2-3 ml of *n*-Hexane (HPLC grade) and transfer into 5.0 ml volume capacity volumetric flask. Rinse the flask containing pesticide residue with *n*-Hexane and make up the final volume up to 5.0 ml. Analyze the extract is analyzed using HPLC or GC-ECD/MSD.

D-5 METHOD FOR 2, 4-D AND 2, 4, 5-T

D-5.1 Follow the sample preparation and clean-up procedure as described in **D-1** to **D-4**.

D-5.2 Derivatize the residue with 3 ml of boron triflouride (BF_3) and heat in water bath for 2 min and then extract this methylated solution with *n*-Hexane and water. Repeat extraction up to 3 times (10 ml each time) and collect all the *n*-Hexane layer (about 30 ml). Concentrate this extract to 5.0 ml in vacuum evaporator at a temperature of not more than 50°C. Analyse the extract by GC-ECD.

D-6 SHORT LIST OF PESTICIDES TO BE ANALYZED

a) DDT, DDD, DDE
b) HCH's
c) Lindane
d) Aldrin
e) Dieldrin
f) Toxaphene
g) Heptachlor, Heptachlorepoxide
h) 2, 4-D
j) 2, 4, 5-T

ANNEX E

(*Table* 1)

LIST OF PESTICIDES REGISTERED FOR USE IN INDIA

E-1 PESTICIDES REGISTERED FOR USE ON COTTON IN INDIA

E-1.1 Herbicides

Alachlor, Diuron, Fluchlosalin, Monosodium Methanearsoante (MSMA), Paraquat Dichloride and Trifluralin.

E-1.2 Fungicides

Carbendazim, Cuprous oxide, Streptomycin and Oxytetracycline and Thiram.

E-1.3 Insecticides

Acephate, BHC, Carbaryl, Carbofuran, Chlorpyriphos, Cypermethrin, Decamethrin, Dicofol, Diflubenuron, Dimethoate, Endosulfan, Fenitrothion, Fenthion, Fenvalerate, Fluvalinate, Lindane, Malathion, Methyl Parathion, Monocrotophos, Nicotine sulphate, Oxydemeton methyl, Permethrin, Phenthoate, Phorate, Phosalone, Phosphamidon, Pyrethrum, Quinalphos, Alphamethrin, Methomyl, Triazophos, Cartap Hydrochloride, Neem based products, Carbosulfan (for cotton seed), Fenpropathrin and Bacillus thuringensis.

E-1.4 Plant Growth Regulators

Chlorocholine Chloride (CCC) or Chlormequat Chloride.

E-2 PESTICIDES REGISTERED FOR USE ON JUTE IN INDIA

E-2.1 Herbicides

Dalapon.

E-2.2 Fungicides

Carbendazim.

E-2.3 Insecticides

Carbaryl, Carbofuran, Endosulfan, Lindane, Phosalone, Quinalphos.

E-3 PESTICIDES USED DURING REARING OF SILK WORM

E-3.1 Insecticides

Dichlorvos.

E-3.2 Fungicides

Carbendazim, Dithianon.

ANNEX F

(*Foreword*)

COMMITTEE COMPOSITION

Chemical Methods of Test Sectional Committee, TX 05

Organization	*Representative(s)*
Textiles Committee, Mumbai	Dr G. S. Nadiger (***Chairman***) Shri E. Viswambharam (***Alternate***)
Ahmedabad Textile Industry's Research Association, Ahmedabad	Director
Bapuji Institute of Engineering and Technology, Davangere	Dr H. L. Vijaykumar Dr K. Murugesh Babu (***Alternate***)
Central Institute for Research on Cotton Technology, Mumbai	Dr (Ms) C. R. Raje Dr R. H. Balasubramanya (***Alternate***)
Central Pollution Control Board, Delhi	Dr M. Q. Ansari Shri Ajay Aggarwal (***Alternate***)
Clariant India Ltd, Mumbai	Dr V. G. Nayak
Directorate of Standardization (Production & Supplies), New Delhi	Lt Col (Dr) R. Srivastava Lt Cdr B. Manjunath (***Alternate***)
Indian Institute of Carpet Technology, Bhadohi	Prof (Dr) K. K. Goswami Shrimati Betty Das Gupta (***Alternate***)
Indian Jute Industries' Research Association, Kolkata	Shri A. K. Banerjee
Jaya Shree Textiles, Rishra	Shri Abhey Nair Shri Pawan Sharma (***Alternate***)
L. N. Chemical Industries, Mumbai	Shri Ketan L. Gandhi
Maniklal Verma Textile Institute, Bhilwara	Dr N. K. Mathur
Man-Made Textile Research Association, Surat	Dr Sandeep R. Naik Shri M. G. Patel (***Alternate***)
Ministry of Defence (DGQA), Kanpur	Lt Col P. P. Naidu Shri Rama Yadav (***Alternate***)
Ministry of Defence (R&D), Kanpur	Ms Archana Vyas Ms Priyanka Katiyar (***Alternate***)
Office of the Textile Commissioner, Mumbai	Shri R. A. Lal
Premier Colorscan Instruments Pvt Ltd, Thane	Shri Raymond Ramrajkar Shri D. I. Desai (***Alternate***)
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